RECENT TRENDS IN MORTALITY RATES BY RACE

Esther Portnoy
University of Illinois
Department of Mathematics
1409 W. Green Street
Urbana IL 61801
(217) 333–3414

In recent months there have been numerous reports in the press and elsewhere indicating that mortality experience of blacks in the U.S. has deteriorated in relation to that of whites.[1] These reports are less than complete, in particular reporting only summary statistics such as life expectancy and rarely mentioning statistical significance. In order to appreciate properly the phenomenon being reported, one must first work back to the underlying data and test for significance. If the data do show a significant change, one can go on to analyze the data in more detail in the hope of uncovering explanations or suggesting remedies.

Sources of data

There are several public sources of racially distinct data on recent trends in mortality rates. Newspaper articles frequently refer to *Health United States 1989* and its predecessors. These annual reports contain overall mortality rates separately by race and sex, but in age groupings of ten years from age 5 to age 84. They also contains a wealth of information that may be helpful in the second stage of the problem: statistics on causes of death; various determinants and measures of health; access to, utilization of, and expenditures for health care.

Another public source is the set of life tables published as part of the annual reports *Vital Statistics of the United States* by the U.S. Department of Health and Human Services. These tables are reconstructed from abridged life tables based on (i) deaths occuring during a calendar year and (ii) midyear population estimates provided by the U.S. Bureau of the Census. Thus they represent not raw but highly processed data, and the complexity of the construction can obscure important features. We may nevertheless use the *Vital Statistics* data as corroboration of evidence found elsewhere.

A better source for the present purpose is the Annual Statistical Supplement to the *Social Security Bulletin*. Along with much economic information, this gives numbers of recipients of the various Social Security benefits, by race, sex and single age, from which mortality rates can be estimated for older Americans.[2] This paper will concentrate on the Social Security data, using the other sources for comparison. Where we see consistent patterns in the three sources we can be reasonably confident of results; where there is substantive disagreement we must ask why.

Table 1 gives, and Figure 1 illustrates, mortality rates among white male retired workers, based on the Social Security data. The ages covered are 72 to 83; years 1984 through 1988. It is obvious that the mortality rates increase with age, with a slight convexity. A trend over time is *not* obvious; the different curves interweave. It is also obvious that the rates for 1988 are much more variable than those for the first four years. The reason for this is that the 1988 rates are based on a 10% sample of data, available some months in advance of the full data. This higher variability will need to be accounted for in the analysis.

The next step is to use standard regression methods to model the mortality rates. The initial model was:

$$1000\ q_x^z = \beta_0 + \beta_1(z-\bar{z}) + \beta_2(x-\bar{x}) + \beta_3(z-\bar{z})^2 + \beta_4(x-\bar{x})^2 + \beta_5(z-\bar{z})(x-\bar{x}) + \\ + \delta_z[\beta_6 + \beta_7(x-\bar{x}) + \beta_8(x-\bar{x})^2] + \epsilon_x^z . \qquad (1)$$

Here δ_z is 1 if $z = 1988$, otherwise 0; $\bar{x} = 77.5$, $\bar{z} = 1986$, and ϵ_x^z is an error term, assumed to have mean 0.

A least–squares regression with equal weighting gave the results summarized in Table 2. They confirm our impression that age and age–squared both have significant positive coefficients (β_2 and β_4). The year effect, although not large, is also significant and indicates a *decrease* in mortality rates over time. The coefficient β_3 for year–squared is also negative, but quite small and the effect is not significant. The fact that the coefficient β_7 is positive means not that mortality rates generally increased in 1988 but that they decreased more for the younger half of this group than for the older half. (We need to add something to our estimate of $1000\ q_x^z$ when $z = 1988$ and $x \geq 78$, subtract something when $z = 1988$ and $x \leq 77$.) The other coefficients are not significantly different from 0, so we revise our model to

$$1000\ q_x^z = \beta_0 + \beta_1(z-\bar{z}) + \beta_2(x-\bar{x}) + \beta_4(x-\bar{x})^2 + \delta_z\beta_7(x-\bar{x}) + \epsilon_x^z .$$

Figure 2 shows the pattern of mortality rates under this model.

Now let us turn to the black male retired workers. This is a smaller group, and Figure 3 makes the greater variability clear. Table 3 give the observed mortality rates, and Table 4 the results of regression. The age and age–squared terms are significant, with positive coefficients; the age–in–1988 term is significant with a *negative* coefficient; the year effect is *positive* but marginally significant. But when the other variables are deleted from the model, and the mortality rates are regressed on year, age, age–squared and age–in–1988, the year effect is more highly significant than the age–squared effect. In other words, we seem to have statistically significant evidence of a trend toward *higher* mortality rates among elderly black males in the mid–1980's, more pronounced in the group aged 72 to 77 than in the older group. Figure 4, however, leads one to suspect that the model may be inappropriate. The higher variability of the last–year data has excessively influenced the fitted model.

Before going on to discuss how to handle the problem of 1988 data, let us take a brief look at the rates among females. Figures and Tables 5 through 8 parallel what we did for males. Note that, among both blacks and whites, females are less likely than males to be in the "retired worker" category.[3] Retired workers are not necessarily a representative sample of the whole population, and the bias may differ considerably between the sexes and between the races.

Among white females we find significant effects for age and age–squared, while age–in–1988 and the cross–term age×year are marginally significant. Among black females, age and age–squared are the only significant terms. The subtle year effects are overwhelmed by variability in the 1988 rates, leaving us with a model that indicates no trend. While not as dramatic as for the black males, this is still a deficiency of the model and has the same source: inappropriate handling of the last year's data.

Handling the 1988 data

As a first step in recovering trend information, we set the last–year data aside and regress only the data through 1987 (Table 9). Particularly for the female data, we see quite a different picture: a marginally significant decrease over time for white females, and a significant increase for black females. The least–squares estimates of β_0 through β_5 have nearly the same values with or without the 1988 data, but the estimates of significance increase dramatically when the 1988 data is omitted. Since an important question here is whether 1988 represents a departure from earlier trends, we must somehow reincorporate the 1988 data.

There are several ways of doing this. One is to do *weighted* regressions. An unweighted regression assumes that the error term in (1) has the same variance for all values of x and z, whereas we know the variance is much larger if z = 1988. (There are, of course, less important variations with x and with $z \leq 1987$.) Properly, we minimize a weighted sum of squared deviations, with the weights being approximately proportional to inverse variance. The error in the stated rates arises not only from binomial sampling; there are other, unidentified sources of error. The regression analysis just done includes an estimate of the variance (s^2 in Table 9) for $z \leq 1987$. For the 1988 data we could do separately a regression against age and age–squared, a method which indicates variances 50 to 80 times as large as those for the earlier years. Weighted regression (Table 10) caused miniscule changes in the estimates of most parameters β_i but did alter the t–values.

Most importantly,

(1) the positive year effect became significant for black females, and

(2) for black males the year effect became more significant while the age–in–1988 effect, that caused the 1988 regressed values to be so different, fell to marginal significance.

Another approach to the 1988 problem is to use the four–year data regression to "predict" values for 1988, and then see whether the recorded values fall within acceptable ranges. Calculation of the ranges requires estimates not only of the error in model–predicted values but also of the error induced by the sampling process. Fortunately, the same 10% sample was reported for 1987 (in the 1988 Annual Statistical Supplement. It is interesting to compare those provisional values to firmer values reported the following year; however, a more useful exercise compares the provisional values to regressed values from Table 9. This comparison suggests a mean squared error of 49.9 in 1000 q_x for white males, 36.5 for white females, 217 for black males and 466 for black females. Table 11 gives a "prediction interval" based on the regression of Table 9 and the above error estimates. For each of the sex/race groups, at least 9 of 12 provisional rates for 1988 fall within the prediction interval; thus, we have no substantial evidence that 1988 deviated from trends of the previous four years.

Comparisons with other data sources

The *Health United States* series gives death rates by sex and race but only in 10–year age groups. For persons aged 75 to 84 group (the most appropriate comparison to the Social Security data) the distribution of single ages may vary substantially by sex and/or race, but probably does not change much over the span of five calendar years. Thus, although comparisons between blacks and whites in terms of the mortality rates themselves may be inappropriate, we should still be able to make some valid observations on trends.

Table 12 gives deaths per 1000 of population (aged 75–84) for the four sex/race combinations, and for years 1983 – 1987, and the results of regressing these rates on year and year–squared. For none of the groups was the year–squared effect significant, though it was close to significant for black females. Regressing on year only, we find that white males experienced a significant decrease in mortality rates over the period; for white females there was a marginally significant decrease; for black males and females there was an increase but it was not statistically significant. As noted earlier, the grouping of data by ages makes it difficult to do much statistical analysis, and the nonsignificance results are not surprising. What we can say is that this data source does not contradict the results from the Social Security data.

Comparable data from the *Vital Statistics* annual life tables is collected in Table 13. These figures are by no means raw data, and it is questionable what sort of statistical analysis would be valid. The following observations, however, are easy enough to make. For white males, the tables indicate a fairly steady decrease at all the ages being considered. Rates for black males at most ages rose through 1986 and then fell in 1987. Rates for black females vary slightly with little overall pattern. For white females there is little change at ages 72–79, some decrease at ages 80 and above. Further investigation should be undertaken to understand the differences between this picture and that presented by the Social Security data.

Concluding remarks

The Social Security data provide convincing evidence that mortality experience among older blacks in the United States has deteriorated. The failure to substantiate alarms about particularly bad experience in 1988 does not detract from the strength of the overall pattern, which should be a cause for concern among all Americans. Concentrating as we have done here on older individuals separates out some of the causes sometimes cited for the differences in mortality patterns, such as higher incidence of violence and drug use among young blacks.

There are many explanations for higher mortality rates among blacks: behavioral patterns such as smoking and diet, "environmental" factors such as marriage (married men have lower mortality rates than single men; white men at these ages are more likely to be married than black men); understatement of age. It is harder to find an explanation for the *change* in mortality differentials. In 1984 black males aged 75 exhibited mortality rates comparable to white males aged 76.2; in 1988 the comparable age was 77.4. It is hard to believe that understatement of age by blacks would have dropped by 1.2 years in the five years covered by this data.

I believe that the major explanation is poverty and its attendant problems. Poverty limits access to medical care, interferes with "good" choices about diet and other behavioral patterns, and makes it difficult to insulate oneself from drug–related violence. Poverty has been exacerbated in the 1980's by the lack of an increase in the minimum wage and the shrinking of support services for the poor. Statistical evidence tying these factors to mortality rates is beyond my ability at the moment, given the data I have. I would welcome suggestions.

[1]A very small sample of such items includes:

New York Times, September 26, 1989: "Black and White Death Rates Continue to Differ, Study Says"

New York Times, October 9, 1989: "Growing Gap in Life Expectancies Of Blacks and Whites Is Emerging"

New York Times, March 23, 1990: "Health Data Show Wide Gap Between Whites and Blacks"

Quaker Service Bulletin, Summer 1990 (Number 166: Vol. 71, No.2): "Crisis in the African American Community"

[2]Although there are people of all ages who receive benefits, and their numbers are reported annually, younger people tend to cease receiving benefits for causes other than death, and so the census–type figures cannot be used to estimate mortality rates. Retirees under age 70 can have benefits withheld because of earnings. The public information gives numbers of such withholdings, and numbers of new retirees, in age groups and not separated by race. Since there is no earnings test above age 70, there are few new retirees above 70; in 1987, with more than 14 million persons aged 70 and over receiving retired–worker benefits, there were only about 13,000 new retirees in this age group. About 97% of terminations of retired–worker benefits at all ages result from the death of the retired worker.

[3]In 1985, among white males aged 75 to 84, about 97% received retired–worker benefits. For black males the figure is about 92%; for white females, 56%; and for black females, 61%. These figures are based on 1985 total population figures given in *Health United States 1987* and retired–worker counts as of the end of 1985 from 1987 *Social Security Bulletin, Annual Statistical Supplement.*

Table 1: Mortality rates based on Social Security data
White male retired workers

Age	1000 q_x 1984	1985	1986	1987	1988
72	48.44	46.30	46.70	45.61	46.93
73	51.71	51.49	51.49	50.33	50.40
74	56.41	57.26	55.99	54.65	45.31
75	61.62	61.89	60.50	59.60	56.15
76	67.12	66.88	66.37	65.91	64.72
77	71.96	73.13	72.48	70.73	72.56
78	79.49	79.80	77.29	77.05	73.76
79	86.15	87.06	84.99	82.81	92.32
80	91.02	93.58	92.32	90.42	87.62
81	99.73	100.98	102.00	98.56	103.19
82	108.43	109.88	107.59	104.54	109.35
83	114.28	119.03	115.54	114.69	118.65

Table 2: Results of regression, white male retired workers

Variable	Coefficient	t–value	
intercept	75.626	136.5	
year	–1.263	–3.169	
age	6.273	66.55	
$year^2$	–0.610	–2.052	
age^2	0.202	7.159	
year×age	–0.001	–0.031	
last–year:			
intercept	2.724	1.425	
age	0.603	2.216	
age^2	0.080	1.277	$s^2 = 4.236$
Reduced model:			
intercept	74.951	183.2	
year	–0.527	–2.746	
age	6.274	71.43	
age^2	0.218	8.467	
age in last year	0.600	3.057	$s^2 = 4.413$

Table 3: Mortality rates based on Social Security data
Black male retired workers

Age	1000 q_x 1984	1985	1986	1987	1988
72	55.75	56.32	58.46	60.29	89.61
73	62.18	60.30	62.95	62.53	75.53
74	66.24	66.94	67.27	68.72	60.67
75	69.34	72.97	75.12	71.14	71.44
76	74.90	70.88	79.83	77.88	100.17
77	83.70	81.32	87.33	81.95	99.43
78	89.15	90.03	89.29	87.93	89.33
79	87.66	90.27	96.44	93.14	92.43
80	100.47	100.27	101.78	101.33	104.50
81	102.22	106.05	105.62	107.18	98.70
82	110.79	111.88	110.16	113.42	89.86
83	117.08	114.90	121.26	121.18	124.83

Table 4: Results of regression, black male retired workers

Variable	Coefficient	t–value	
intercept	85.986	54.68	
year	0.720	0.636	
age	5.539	20.70	
$year^2$	–0.239	–0.284	
age^2	0.089	1.115	
year×age	0.032	0.148	
last–year:			
intercept	2.211	0.408	
age	–2.406	–3.114	
age^2	0.137	0.766	$s^2 = 34.14$
Reduced model:			
intercept	85.950	77.16	
year	1.488	2.851	
age	5.523	23.10	
age^2	0.117	1.665	
age in last year	–2.325	–4.349	$s^2 = 32.70$

Table 5: Mortality rates based on Social Security data
White female retired workers

Age	1000 q_x 1984	1985	1986	1987	1988
72	23.27	22.53	23.50	24.84	20.78
73	24.89	25.76	25.93	26.88	31.08
74	28.47	29.02	29.21	29.19	28.18
75	32.47	31.72	31.81	32.74	28.16
76	35.47	35.95	35.31	36.40	29.89
77	39.05	40.08	39.58	38.84	42.48
78	43.99	44.25	43.38	43.13	48.73
79	47.45	49.06	48.26	47.78	43.02
80	53.13	54.34	53.69	52.98	53.21
81	58.75	59.77	58.32	59.03	64.51
82	65.51	66.54	66.63	66.54	68.83
83	73.82	75.47	72.12	71.72	68.05

Table 6: Results of regression, white female retired workers

Variable	Coefficient	t–value	
intercept	41.533	74.23	
year	–0.130	–0.322	
age	4.387	46.08	
$year^2$	–0.143	–0.478	
age^2	0.229	8.062	
year×age	–0.089	–1.148	
last–year:			
intercept	0.867	0.449	
age	0.284	1.034	
age^2	0.284	1.034	$s^2 = 4.322$
Reduced model:			
intercept	41.420	106.1	
age	4.444	59.27	
age^2	0.223	9.078	$s^2 = 4.019$

Table 7: Mortality rates based on Social Security data
Black female retired workers

Age	1000 q_x 1984	1985	1986	1987	1988
72	28.82	28.67	28.33	28.39	42.54
73	32.60	32.31	31.15	33.47	29.74
74	36.13	35.86	38.04	36.37	30.94
75	40.14	38.72	41.12	41.76	42.74
76	41.35	43.41	44.17	44.60	44.84
77	46.29	49.81	46.75	48.22	44.27
78	50.40	50.86	48.31	51.52	74.36
79	55.90	55.15	52.59	56.63	48.36
80	58.74	58.91	58.21	62.11	68.45
81	65.48	64.43	64.73	66.89	54.77
82	70.11	72.27	71.43	69.26	85.34
83	78.71	76.89	78.35	82.06	69.88

Table 8: Results of regression, black female retired workers

Variable	Coefficient	t–value	
intercept	48.807	36.38	
year	0.704	0.729	
age	4.333	18.98	
$year^2$	0.323	0.449	
age^2	0.153	2.237	
year×age	0.031	0.166	
last–year:			
intercept	0.318	0.069	
age	–0.419	–0.636	
age^2	–0.052	–0.344	$s^2 = 24.84$
Reduced model:			
intercept	49.518	52.29	
age	4.249	23.37	
age^2	0.142	2.388	$s^2 = 23.63$

Table 9: Regression, first four years only

Variable	Coeff.	t–value	Reduced model:	
White males:				
intercept	75.626	312.9	75.626	316.6
year	−1.263	−7.263	−1.263	−7.349
age	6.273	152.5	6.274	169.0
$year^2$	−0.610	−4.703	−0.610	−4.758
age^2	0.202	16.405	0.202	16.599
year×age	−0.001	−0.031		
	$s^2 = 0.8066$		$s^2 = 0.788$	
Black males:				
intercept	85.986	153.3	85.75	183.6
year	0.720	1.783	0.959	3.613
age	5.539	58.01	5.523	64.24
$year^2$	−0.239	−0.795		
age^2	0.089	3.126	0.089	3.170
year×age	0.032	0.414		
	$s^2 = 4.346$		$s^2 = 4.227$	
White females:				
intercept	41.533	196.6	41.383	243.1
year	−0.130	−0.854		
age	4.387	122.0	4.387	122.5
$year^2$	−0.143	−1.266		
age^2	0.229	21.347	0.229	21.44
year×age	−0.089	−3.039	−0.089	−3.052
	$s^2 = 0.616$		$s^2 = 0.611$	
Black females:				
intercept	48.807	114.4	49.131	136.1
year	0.704	2.294	0.381	1.86
age	4.333	59.691	4.317	64.96
$year^2$	0.323	1.414		
age^2	0.153	7.036	0.153	7.014
year×age	0.031	0.522		
	$s^2 = 2.511$		$s^2 = 2.527$	

Table 10: Results of weighted regression

	Coeff.	t–value	Reduced model	
White males:				
intercept	75.626	327.6	75.621	333.5
year	–1.263	–7.605	–1.263	–7.73
age	6.273	159.676	6.274	177.92
$year^2$	–0.610	–4.924	–0.610	–5.01
age^2	0.202	17.177	0.202	17.55
year×age	–0.001	–0.032		
last–year:				
intercept	2.724	0.996	3.628	1.99
age	0.603	1.171	0.600	1.20
age^2	0.080	0.483		
White females:				
intercept	41.533	201.96	41.384	255.86
year	–0.130	–0.88		
age	4.387	125.35	4.390	129.79
$year^2$	–0.144	–1.301		
age^2	0.229	21.933	0.229	22.55
year×age	–0.089	–3.123	–0.087	–3.144
last–year:				
intercept	0.867	0.356		
age	0.284	0.620		
age^2	–0.033	–0.222		
Black males:				
intercept	85.986	156.081	85.764	190.06
year	0.720	1.816	0.985	3.87
age	5.539	59.078	5.523	66.15
$year^2$	–0.239	–0.810		
age^2	0.089	3.184	0.090	3.297
year×age	0.032	0.422		
last–year:				
intercept	2.211	0.339		
age	–2.406	–1.958	–2.325	–1.964
age^2	0.137	0.345		
Black females:				
intercept	48.807	114.16	49.146	140.0
year	0.704	2.289	0.393	1.985
age	4.333	59.545	4.315	66.59
$year^2$	0.323	1.410		
age^2	0.153	7.019	0.152	7.181
year×age	0.031	0.521		
last–year:				
intercept	0.318	0.063		
age	–0.419	–0.439		
age^2	–0.053	–0.170		

Table 11: Prediction intervals for 1988 data, based on projections from reduced model of Table 9, ± √MSE estimates. Stars (*) indicate that 1988 provisional data lies outside interval.

Age	White males	Black males	Black females	White females
72	(35.4,49.5)	(42.1,77.9)*	(9.2,52.4)	(19.1,31.2)
73	(39.6,53.8)	(46.8,82.5)	(12.0,55.1)	(21.1,33.1)
74	(44.2,58.3)	(51.6,87.3)	(15.1,58.2)	(23.4,35.5)
75	(49.2,63.4)	(56.6,92.3)	(18.6,61.7)	(26.3,38.3)
76	(54.6,68.7)	(61.7,97.4)*	(22.2,65.4)	(29.6,41.6)
77	(60.5,74.6)	(67.1,102.8)	(26.2,69.4)	(33.3,45.4)
78	(66.7,80.9)	(72.6,108.3)	(30.5,73.7)*	(37.5,49.6)
79	(73.4,87.6)*	(78.3,114.0)	(35.1,78.3)	(42.2,54.3)
80	(80.6,94.7)	(84.2,119.9)	(40.1,83.2)	(47.3,59.4)
81	(88.1,102.2)*	(90.2,126.0)	(45.3,88.5)	(52.9,65.0)
82	(96.1,110.2)	(96.5,132.2)*	(50.8,94.0)	(58.9,71.0)
83	(104.4,118.6)*	(102.9,138.6)	(56.7,99.8)	(65.4,77.5)

Table 12: Deaths per 1000 of population aged 75–84, age, sex and year
Data from *Health United States* (various years)

	1983	1984	1985	1986	1987
White males	85.6	84.6	85.0	83.4	82.1
Black males	91.0	90.2	93.0	92.9	92.4
White females	51.6	51.4	51.7	51.1	50.8
Black females	60.6	61.8	62.5	61.5	61.5

Regressing on year and year-squared:

	Coefficient	t-value	Reduced model	
White males:				
intercept	84.51	349.4	84.14	315.32
year	−0.82	−4.79	−0.82	−4.35
$year^2$	−0.186	−1.28		
Black males:				
intercept	92.23	175.65	91.9	201.02
year	0.55	1.48	0.55	1.70
$year^2$	−0.16	−0.52		
White females:				
intercept	51.48	513.31	51.32	459.63
year	−0.19	−2.68	−0.19	−2.41
$year^2$	−0.08	−1.31		
Black females:				
intercept	62.17	295.6	61.58	186.07
year	0.15	1.01	0.15	0.64
$year^2$	−0.293	−2.33		

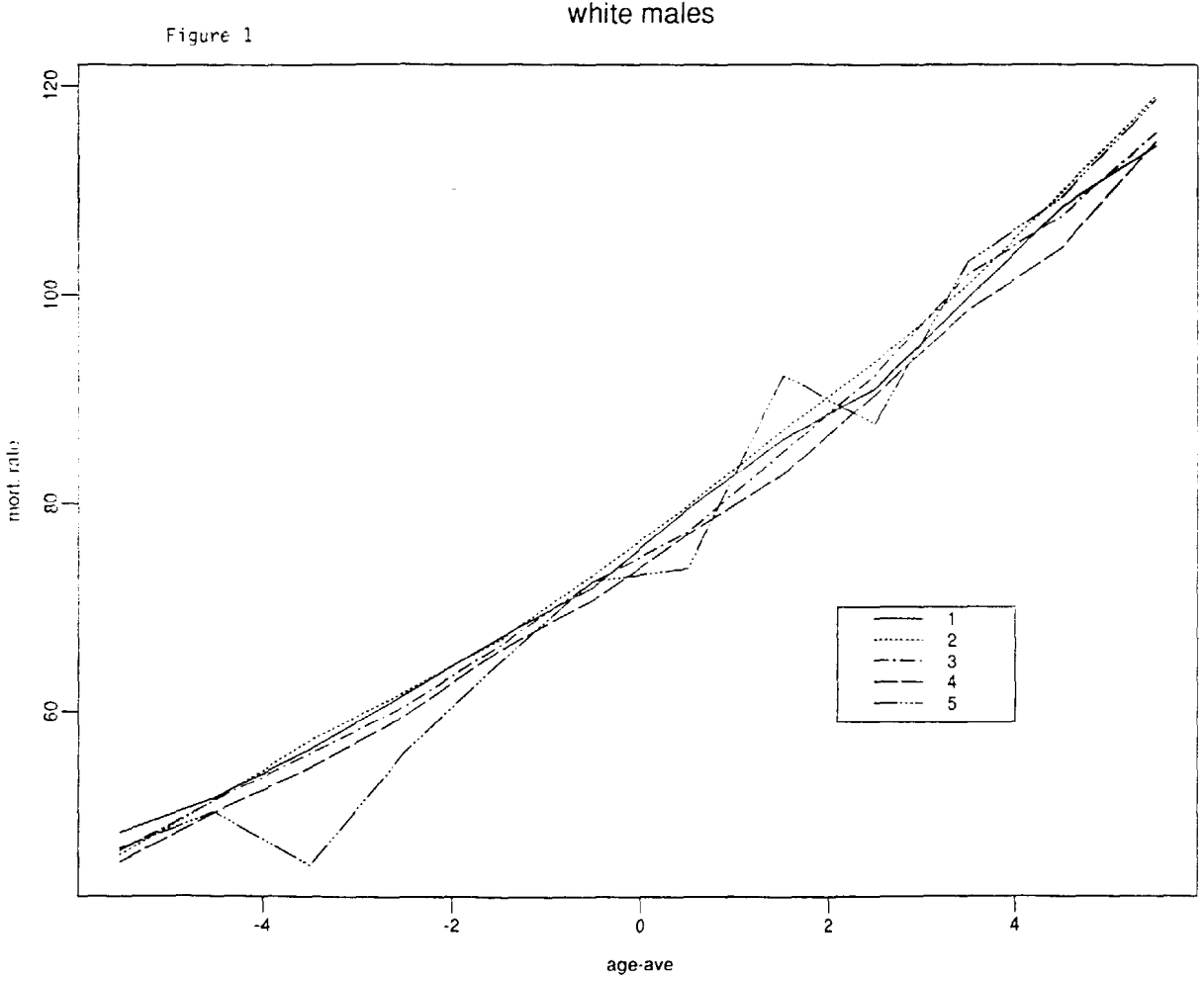
Table 13: Mortality rates derived from life tables in *Vital Statistics of the United States*

	$1000\ q_x$				
	1983	1984	1985	1986	1987
White males					
72	46.75	46.01	46.00	45.35	44.37
73	50.86	50.05	50.04	49.30	48.29
74	55.33	54.38	54.33	53.43	52.37
75	60.16	59.07	58.93	57.83	56.71
76	65.33	64.13	63.92	62.62	61.47
77	70.91	69.60	69.41	67.91	66.71
78	76.86	75.54	75.43	73.81	72.56
79	83.23	81.94	82.02	80.33	79.04
80	90.03	88.92	89.27	87.57	86.21
81	97.31	96.44	97.17	95.49	94.07
82	104.97	104.51	105.77	104.12	102.65
83	113.01	113.07	115.00	113.39	111.81
Black males					
72	60.89	59.94	59.17	56.93	56.01
73	64.14	63.09	62.59	60.69	59.58
74	66.37	65.23	65.49	64.45	63.15
75	68.23	67.02	68.24	68.36	66.90
76	70.44	69.21	71.43	72.67	71.07
77	73.74	72.45	75.47	77.58	75.89
78	78.56	77.26	80.80	83.22	81.53
79	85.07	83.80	87.52	89.73	88.08
80	93.32	92.18	95.78	97.04	95.75
81	103.30	102.37	105.60	105.26	104.69
82	114.68	114.19	116.96	114.32	115.03
83	127.21	127.58	129.88	123.96	127.06
Black females					
72	36.95	36.47	35.88	34.94	34.71
73	39.15	38.67	38.28	37.40	36.99
74	40.87	40.43	40.50	39.84	39.24
75	42.56	42.19	42.86	42.47	41.66
76	44.66	44.43	45.63	45.48	44.52
77	47.58	47.52	49.10	49.02	48.00
78	51.57	51.75	53.39	53.29	52.29
79	56.70	57.21	58.67	58.32	57.52
80	62.99	63.99	65.03	64.23	63.79
81	70.46	72.12	72.55	71.12	71.31
82	79.07	81.75	81.37	79.10	80.25
83	88.86	93.00	91.74	88.44	90.96

Table 13 (continued)
White females

72	24.92	24.90	24.90	25.13	24.70
73	27.28	27.27	27.29	27.44	27.02
74	29.88	29.89	29.91	29.93	29.53
75	32.76	32.79	32.83	32.68	32.33
76	35.98	36.01	36.08	35.76	35.44
77	39.56	39.60	39.69	39.23	38.93
78	43.62	43.60	43.76	43.19	42.87
79	48.22	48.13	48.35	47.69	47.36
80	53.50	53.28	53.58	52.86	52.50
81	59.55	59.22	59.62	58.84	58.39
82	66.62	66.10	66.65	65.75	65.25
83	74.98	74.24	74.94	73.89	73.33

Figure 1



white males -- fitted values

Figure 2

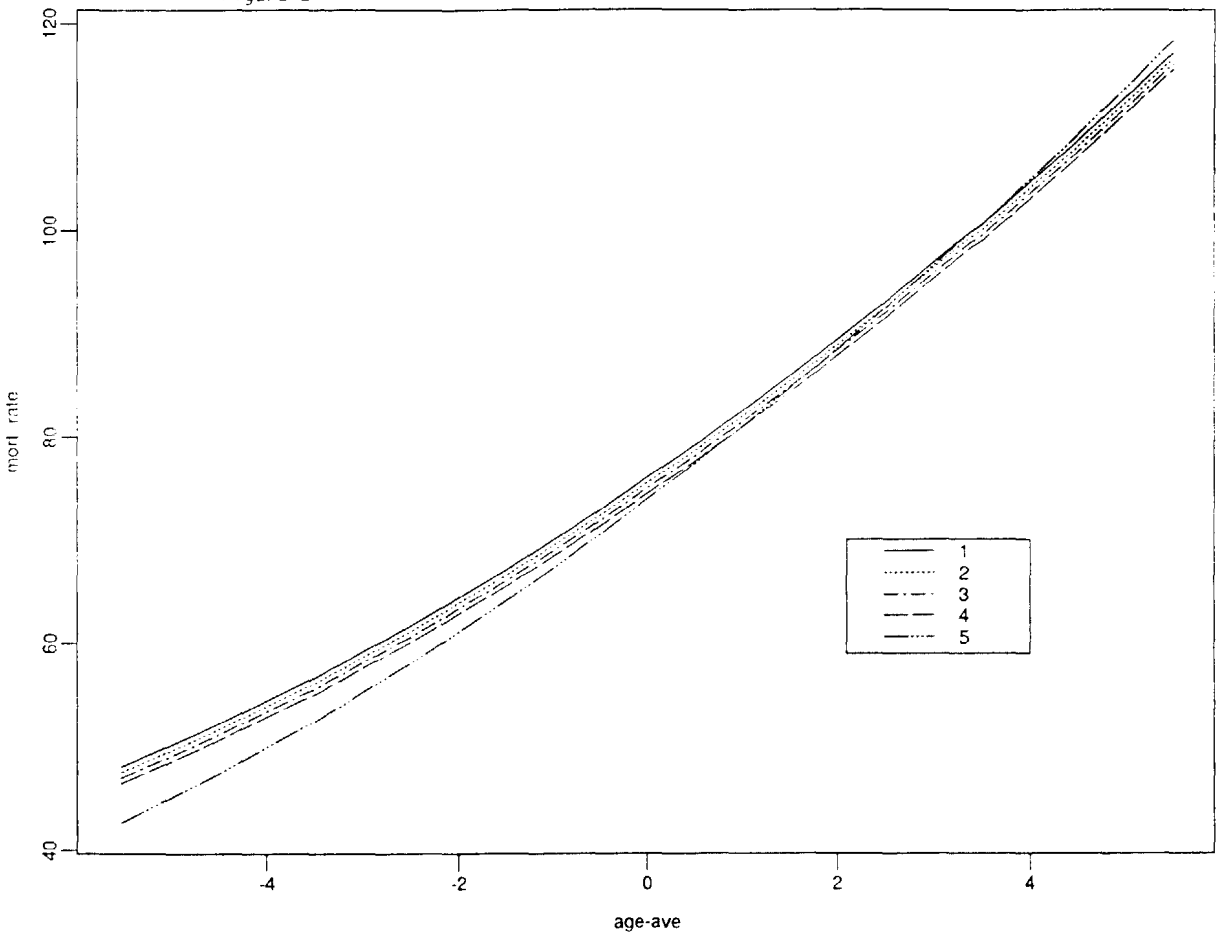


Figure 3

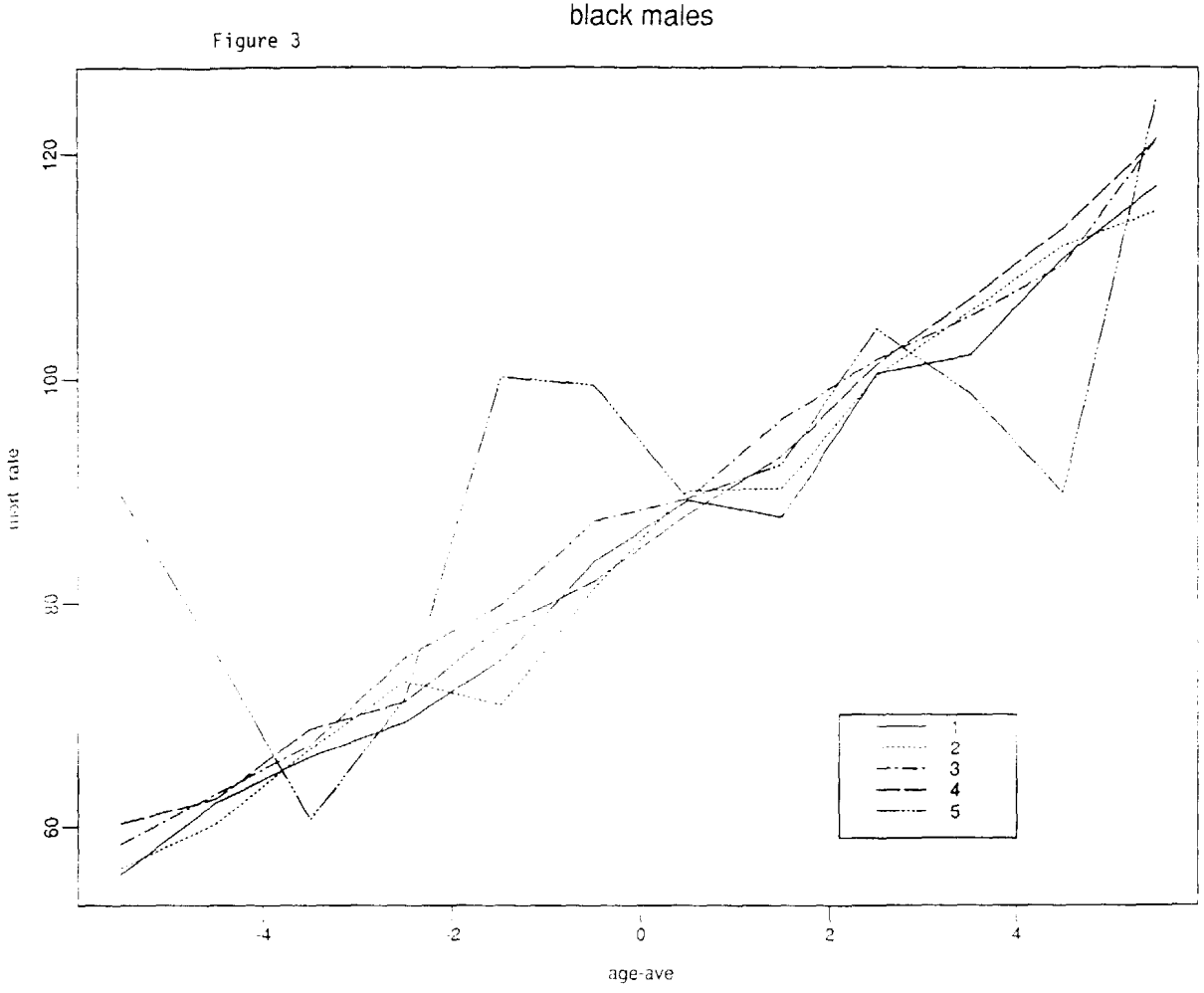


Figure 4

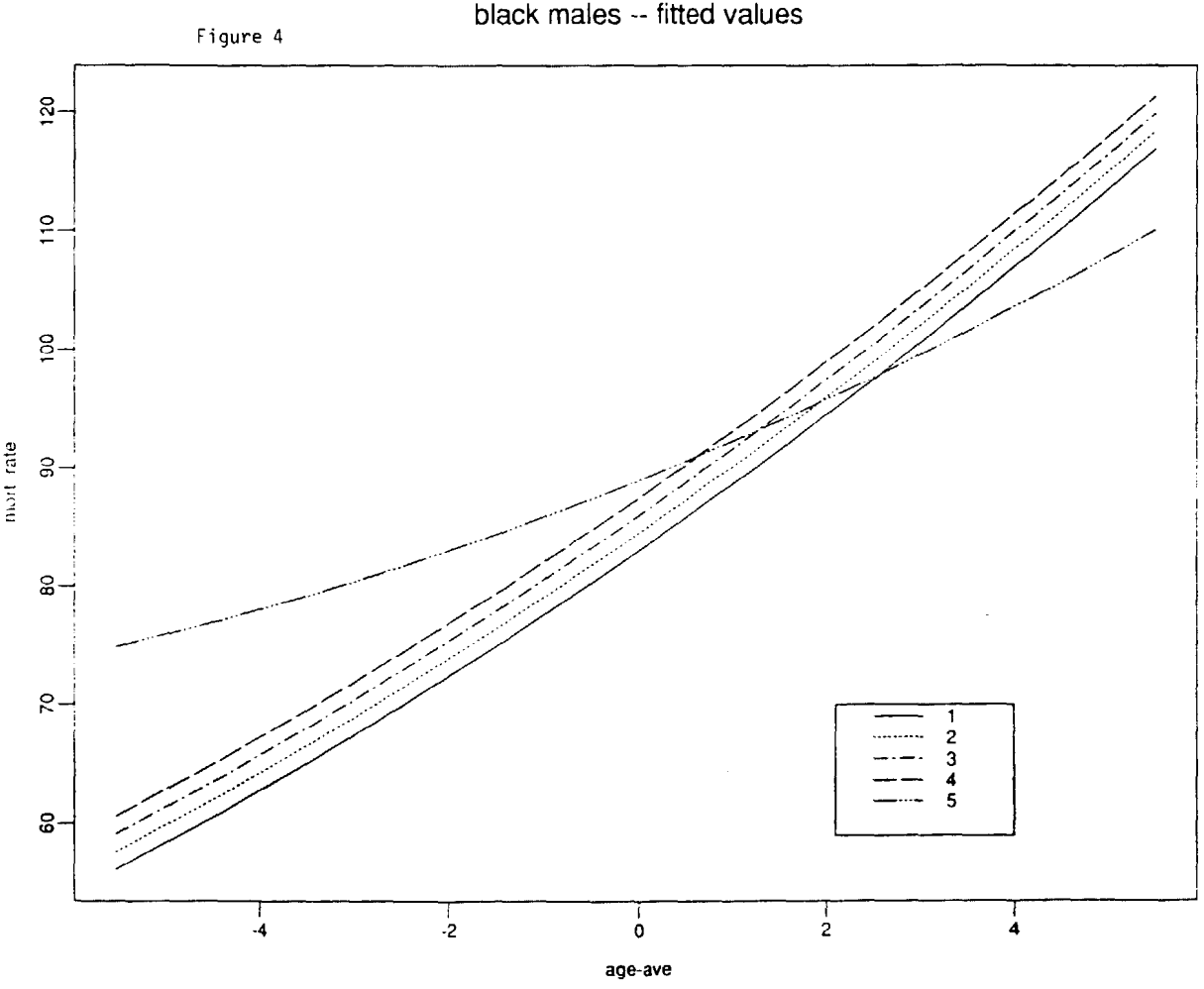

black males -- fitted values
60
70
80
90
100
110
120
-4
-2
0
2
4
age-ave
1
2
3
4
5

Figure 5

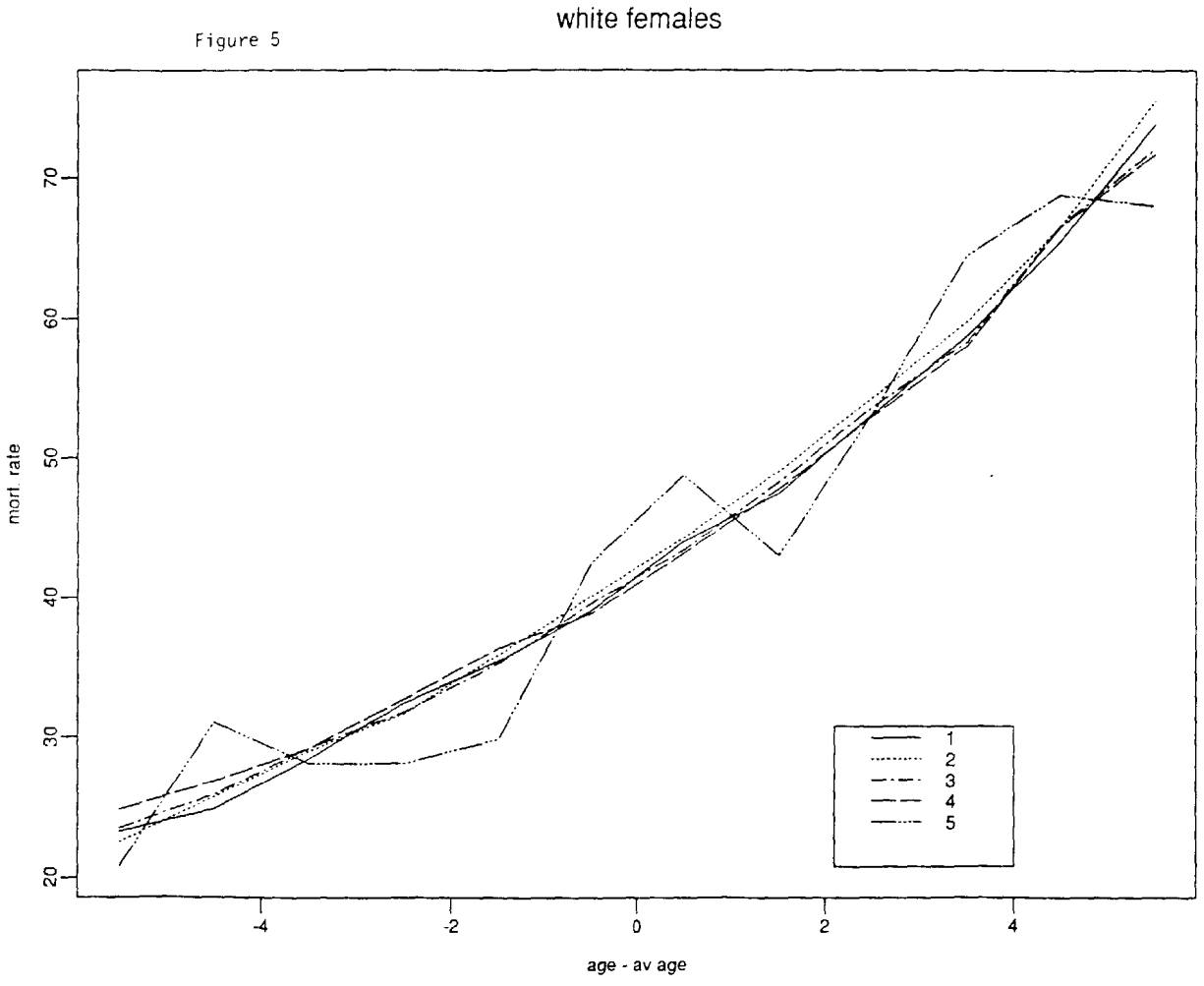

white females
mort rate
20
30
40
50
60
70
-4
-2
0
2
4
age - av age
1
2
3
4
5

Figure 6

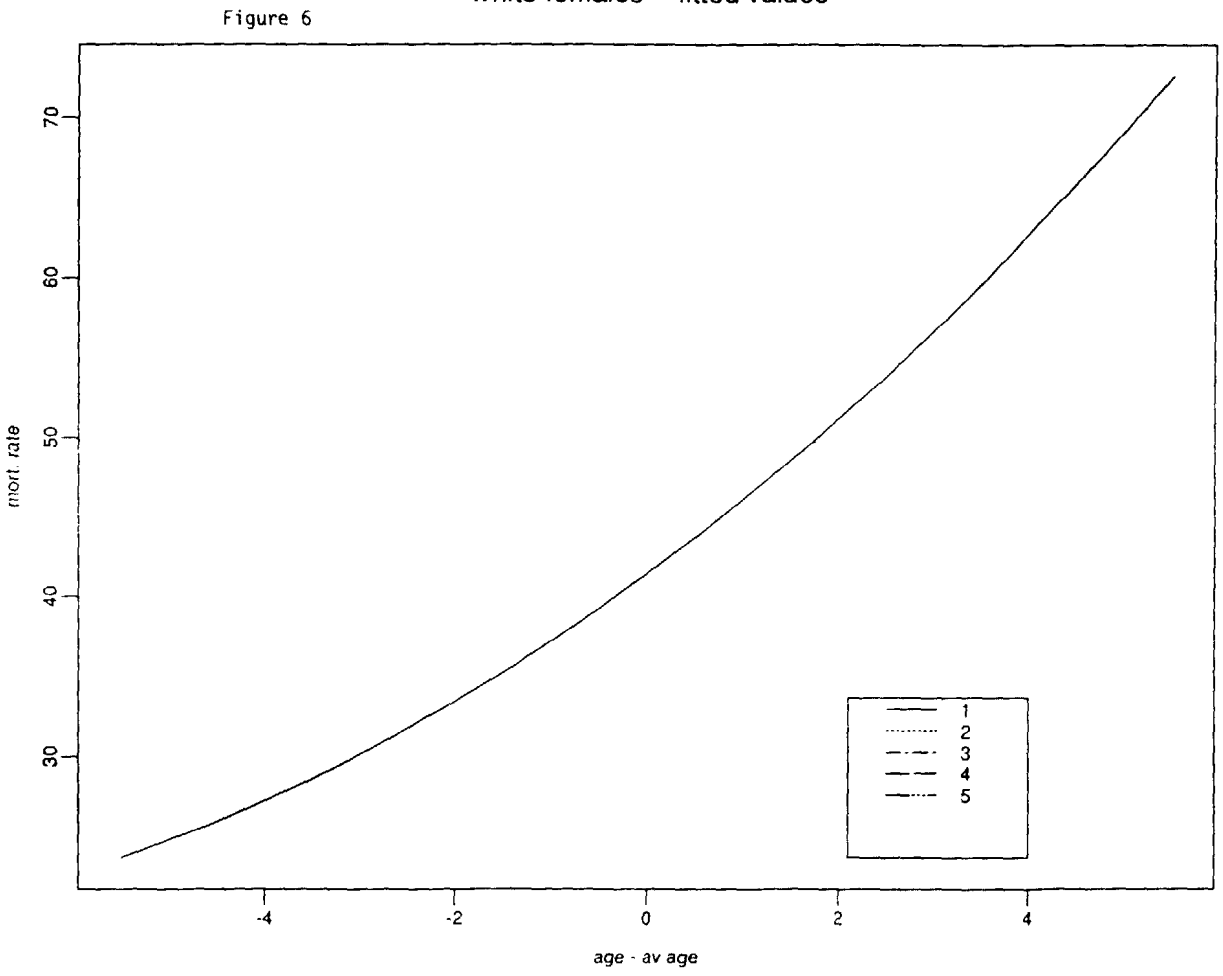

white females -- fitted values
mort rate
70
60
50
40
30
-4
-2
0
2
4
age - av age
1
2
3
4
5

Figure 7

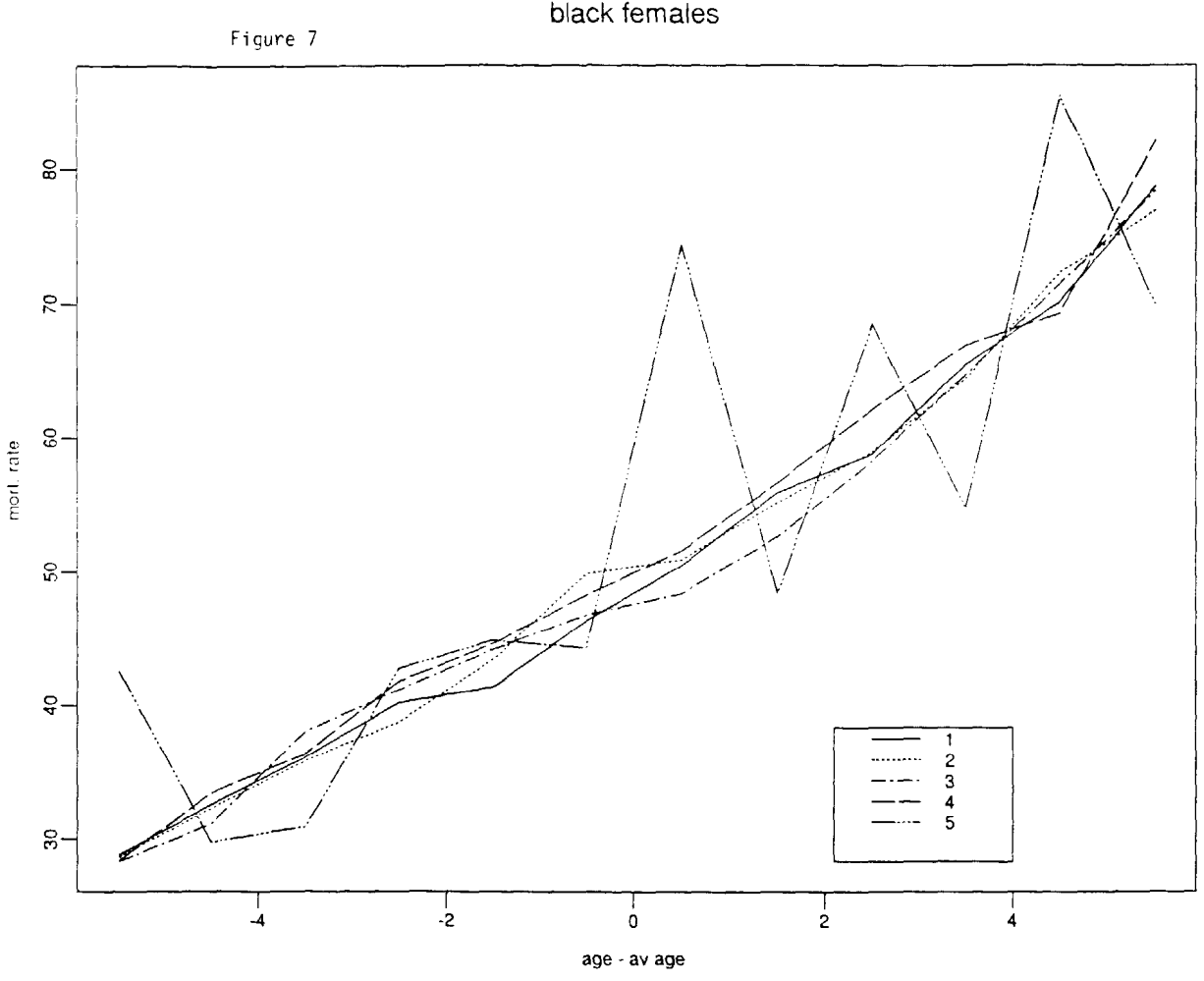
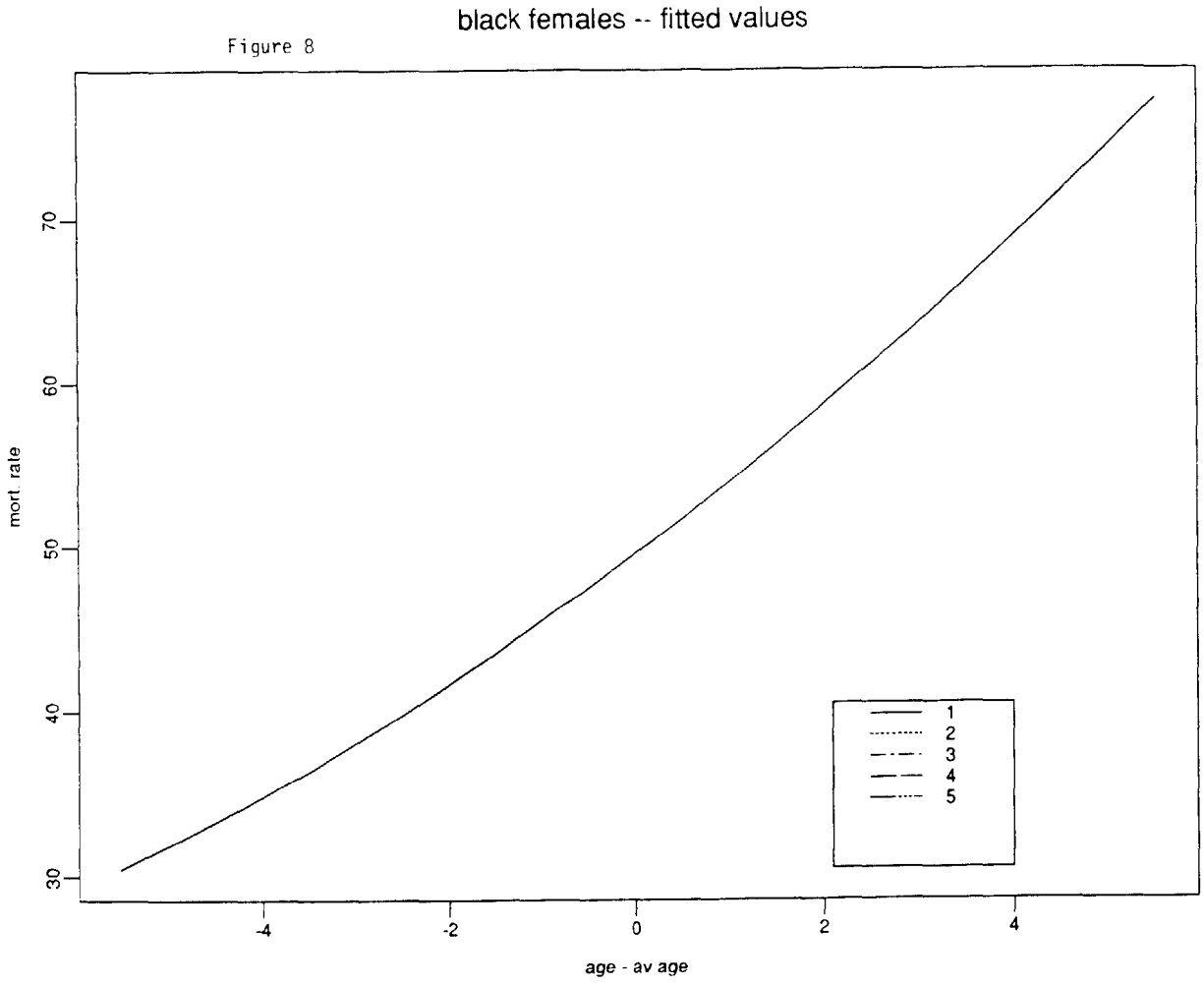

black females
mort rate
30
40
50
60
70
80
-4
-2
0
2
4
age - av age
1
2
3
4
5

Figure 8


black females -- fitted values
mort rate
70
60
50
40
30
-4
-2
0
2
4
age - av age
1
2
3
4
5